

Notice of Allowability

Application No.

10/622,257

Examiner

Jill M. Gray

Applicant(s)

GOLECKI ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment of August 6, 2004.
2. ☒ The allowed claim(s) is/are 1-15, 17-24, and 26-27, renumbered 1-25.
3. ☒ The drawings filed on 17 June 2004 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
 - * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 10/27/04
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Election/Restrictions

Applicants' traversal of the restriction requirement has been considered and found to be persuasive. Accordingly, the restriction requirement has been withdrawn. Claims 1-15, 17-24, and 26-27 are under prosecution.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Gallagher on October 28, 2004.

The application has been amended as follows:

In the claims:

1. (currently amended) A method of protecting a carbon fiber or carbon-carbon (C-C) composite component against high temperature oxidation, said method comprising the steps of:

applying a coating of fluidized borophosphate glass precursor over the component by immersing the [[C-C]] component in a bath containing glass precursor components including 25-50 weight-% phosphoric acid, 1-10 weight-% manganese phosphate, 2-20 weight-% potassium hydroxide, 1-10 weight-% boron nitride, 0-30 weight-% boron carbide, and 20-60 weight-% water;

gradually heating the glass precursor-coated component to a temperature range at which the glass transition temperature of the glass will be a glass formed from the glass precursor is thermally matched to the oxidation temperature range of the carbon in the [[C-C]] component, thereby forming a glass-coated component;

continuing to heat the glass-coated component to anneal the glass-coated component ~~facilitate desired chemical reactions in the glass and glass precursor, as well as stress reduction;~~ and

gradually cooling the glass-coated component, thereby enveloping to envelop said component in a solid glass coating which protects it against high temperatures oxidation.

4. (currently amended) The method of claim 1, comprising the steps of:

preparing a liquid glass precursor including 25-50 weight-% phosphoric acid, 1-10 weight-% manganese phosphate, 2-20 weight-% potassium hydroxide, 1-10 weight-% boron nitride, 0-30 weight-% boron carbide, and 20-60 weight-% water;

maintaining the precursor at a temperature in the range of between about 20-90°C;

applying a coating of the liquid precursor to an outer surface of the component; and

annealing the coated component at a temperature in the range of about 250-650°C,

thereby creating a solid glass protective coating of about 1-10 mils thickness around the component for protecting the component from oxidizing species.

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5. (currently amended) An article comprising:

a component, made of carbon fiber or carbon-carbon (C-C) composite having a thickness of about 0.5 to 1.5 inches, annealed at a temperature in the range of about 2200-2600°C; and

a glass coating of about 1-10 milg [[mil]], made with a mixture containing 20-60 weight-% water, 25-50 weight-% phosphoric acid, 2-20 weight-% alkali metal hydroxide, 1-10 weight-% manganese phosphate, 0-10 weight-% boron nitride, 0-13 weight-% elemental boron, and 2-50 weight-% boron carbide,

wherein said glass coating covers and protects said component against oxidizing species when the article is subjected to temperatures of up to about 900°C.

7. (currently amended) A method of protecting a thin-gauge carbon fiber or carbon-carbon (C-C) composite component against oxidation, the method comprising the steps of:

applying a coating of fluidized borophosphate glass precursor over the component by immersing the [[C-C]] component in a bath containing glass precursor components including at

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least 2 weight-% boron carbide and no more than 13 weight-% elemental boron;

gradually heating the glass precursor-coated component to a temperature range at which the glass transition temperature of the glass will be a glass formed from the glass precursor is thermally matched to the oxidation temperature range of the carbon in the [[C-C]] component, thereby forming a glass-coated component;

continuing to heat the glass-coated component to anneal the glass-coated component ~~facilitate desired chemical reactions in the glass and glass precursor, as well as stress reduction;~~ and

gradually cooling the glass-coated component, thereby enveloping to envelop said component in a solid glass coating which protects it against high temperatures oxidation.

11. (currently amended) The method of claim 7, wherein the coating of fluidized glass precursor is applied by rotating either the [[C-C]] component or the bath relative to one another when the component is immersed in the fluidized glass precursor to completely and uniformly cover the component with the fluidized glass precursor.

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15. (currently amended) A method of protecting a thin-gauge carbon fiber or carbon-carbon (C-C) composite component against oxidation, the method comprising the steps of:

preparing a liquid glass precursor including 25-50 weight-% phosphoric acid, 1-10 weight-% manganese phosphate, 2-20 weight-% potassium hydroxide, 0-10 weight-% boron nitride, 2-28 weight-% boron carbide, and 20-60 weight-% water;

maintaining the liquid glass precursor at a temperature in the range of between about 20-90°C;

applying a coating of the liquid glass precursor to an outer surface of the component; and

annealing the coated component at a temperature in the range of about 250-650°C,

thereby creating a solid glass protective coating of about 1-10 mils thickness around the component for protecting the component from oxidizing species.

16. (cancelled).

17. (currently amended) The method of claim 15, wherein the liquid precursor components comprise 20-60 weight-% water, 25-50 weight-% phosphoric acid, 2-20 weight-% ~~alkali metal~~ potassium hydroxide, 1-10 weight-% manganese phosphate, 1-10 weight-% boron nitride, 0-5 weight-% elemental boron, and 10-28 weight-% boron carbide.

20. (currently amended) The method of claim 15, wherein the [[C-C]] component has a thickness of about 3-30 mils.

22. (currently amended) A method of forming an oxidation protected carbon-carbon (C-C) composite component, the method comprising:

forming thin-gauge two-dimensional woven fabric panels;

rigidizing the panels with a small percentage of carbon-containing resin;

carbonizing the panels at a temperature in the range of about 800-1000°C;

densifying by chemical vapor deposition;

annealing the component at a temperature in the range of about 2200-2600°C; and

applying a coating of fluidized glass precursor over the component, by immersing the [[C-C]] component in a bath

containing glass precursor components including at least 2 weight-% boron carbide and no more than 13 weight-% elemental boron, to cover the [[C-C]] component, thereby protecting the component against oxidizing species.

25. (cancelled).

27. (currently amended) The article of claim 24, wherein the glass precursor components comprise 20-60 weight-% water, 25-50 weight-% phosphoric acid, 2-20 weight-% alkali metal hydroxide, 1-10 weight-% manganese phosphate, 1-10 weight-% boron nitride, 0-5 weight-% elemental boron, and 10-28 weight-% boron carbide.

The following is an examiner's statement of reasons for allowance: Applicants' arguments have been fully considered and found to be persuasive to overcome the prior art rejection of claims 7-8, 11-15, and 18-20. In particular, the prior art of record does not teach or suggest the inclusion of at least 2 wt% boron carbide in a fluidized borophosphate glass precursor and glass coating formed therefrom as required by claims 5, 7, 15, 22, and 24. As to claim 1, the prior art of record does not teach or suggest a method of protecting a carbon fiber or carbon-carbon composite component against high temperature oxidation, said method comprising applying a coating of a fluidized borophosphate glass precursor over a component, said glass precursor comprising the claimed combination of components, in particular boron nitride in the requisite amount.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably


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accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jill M. Gray whose telephone number is 571-272-1524. The examiner can normally be reached on M-F 10:30-7:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-3186. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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SUPERVISORY PATENT EXAMINER 1-30-11
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